WOLF CREEK
NUCLEAR OPERATING CORPORATION

Terry J Garrett
Vice President, Engineering

August 31, 2005

ET 05-0018

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: Letter WM 05-0007, dated March 1, 2005, from Richard A. Muench, WCNOC, to USNRC

Subject: Docket 50-482: Wolf Creek Nuclear Operating Corporation Response to Generic Letter 2004-02: Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors

Gentlemen:

In accordance with 10 CFR 50.54(f), this letter provides the Wolf Creek Nuclear Operating Corporation (WCNOC) response to Requested Information Item 2 of NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." Requested Information Item 2 requests information related to conformance with regulatory requirements and corrective actions associated with the analysis of the impact of debris-laden fluids during design basis accidents.

In addition this letter transmits a change in a WCNOC regulatory commitment contained in the reference letter. This commitment change is being submitted in accordance with guidance provided by industry document NEI 99-04, "Guidelines for Managing NRC Commitment Changes," as endorsed in Regulatory Issues Summary 00-017, "Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff."

The reference letter contains a commitment to perform an analysis of the susceptibility of the Emergency Core Cooling System and Containment Spray System recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids by September 1, 2005. Although analysis activities are ongoing as described in this letter, WCNOC has not completed the entire analysis package at this time. Commitments contained in this letter supercede the aforementioned commitment.

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P.O. Box 411 / Burlington, KS 66839 / Phone: (620) 364-8831

Attachment II to this letter provides WCNOC's response to the requested information. Attachment III lists WCNOC's commitments contained in this letter. If you have any questions concerning this matter, please contact me at (620) 364-4084, or Mr. Kevin Moles at (620) 364-4126.

Very truly yours,

Terry J. Garrett

TJG/rlg

Attachments: I Oath
II Response to NRC Generic Letter 2004-02
III List of Commitments

cc: J. N. Donohew (NRC), w/a
W. B. Jones (NRC), w/a
B. S. Mallett (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Terry J. Garrett, of lawful age, being first duly sworn upon oath says that he is Vice President Engineering of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the contents thereof; that he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By ______________________
Terry J. Garrett
Vice President Engineering

SUBSCRIBED and sworn to before me this 31st day of Aug , 2005.

Mary E. Gifford.
Notary Public

MARY E. GIFFORD
Notary Public - State of Kansas
My Appt. Expires 12/09/2007

Expiration Date 12/09/2007

Response to Requested Information Item 2 of Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors"

Below is the Wolf Creek Nuclear Operating Corporation (WCNOC) response to Requested Information Item 2 of Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." As described below, portions of the Generic Letter 2004-02 requested information cannot be provided at this time since associated analyses, testing, and evaluations are not yet complete. An update to applicable portions of the information provided below will be submitted by June 1, 2006. The generic letter's "Requested Information" is shown in bold followed by WCNOC's response.

NRC Requested Information 2:

Addressees are requested to provide the following information no later than September 1, 2005:

NRC Requested Information 2(a):

[Provide] Confirmation that the ECCS and CSS recirculation functions under debris loading conditions are or will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made and this licensing basis has been updated to reflect the results of the analysis described above.

WCNOC Response 2(a):

Activities are currently underway to ensure that the Emergency Core Cooling System (ECCS) and Containment Spray System (CSS) recirculation functions under debris loading conditions at Wolf Creek Generating Station (WCGS) will continue to be in full compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of Generic Letter 2004-02. This will be achieved through analysis, evaluations, plant modifications, and plant program and process changes that will be implemented by December 31, 2007. Following the implementation of plant modifications and other changes described below, the ECCS and CSS recirculation functions will continue to support the 10 CFR 50.46 requirement for the ECCS to provide long-term cooling of the reactor core following a loss of coolant accident (LOCA), as well as the requirements of 10 CFR 50 Appendix A, General Design Criteria (GDC); GDC 35 for ECCS design, GDC 38 for containment heat removal systems, and GDC 41 for containment atmosphere cleanup. In addition, the CSS will continue to provide a mechanism to reduce the accident source term to support meeting the limits of 10 CFR Part 100.

By the end of the Fall 2006 refueling outage, replacement sump strainers will be installed at WCGS to increase the available strainer area from less than 400 square feet currently available to an expected available area of approximately 6400 square feet. The exact strainer size that will be installed has not yet been finalized as of this date. The proposed replacement strainer size is based on the largest available sump strainer area that would fit within the bounds of the current containment sump area (i.e. not extend into adjacent areas) and be compatible with the containment post-accident water level. WCNOC anticipates that the sump strainer size selected will exceed the maximum sump strainer surface area required to support the debris generation and transport evaluations; thereby providing margin.

Several supporting activities require completion to fully address Generic Letter 2004-02. These activities are:

- Calculation of debris generation, and debris transport, consistent with applicable industry guidance and regulatory requirements.
- Confirmation that the replacement sump strainer design provides for available net positive suction head (NPSH) to be in excess of required NPSH.
- A sump strainer structural analysis, consistent with industry accepted practices and applicable regulatory guidance.
- An evaluation of the downstream effects of debris passing through the containment sump strainer, consistent with industry guidance.
- An evaluation of the potential water inventory holdup points (i.e. upstream effects).
- An evaluation of the chemical effects impact on sump-strainer head loss.
- Other potential modifications based on the Generic Letter 2004-02 analyses.

NRC Requested Information 2(b):

> **[Provide] A general description of and implementation schedule for all corrective actions, including any plant modifications, that you identified while responding to this generic letter. Efforts to implement the identified actions should be initiated no later than the first refueling outage after April 1, 2006. All actions should be completed by December 31, 2007. Provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006. If all corrective actions will not be completed by December 31, 2007, describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.**

WCNOC Response 2(b):

As provided in the response to Requested Information Item 2(a) above, WCNOC will fully implement all GL 2004-02 required corrective actions by December 31, 2007.

Table 1 below lists all currently identified actions, including previously completed actions and planned future actions as they relate to evaluations requested by Generic Letter 2004-02. The table also includes the completion date or planned completion schedule. The corrective actions listed in Table 1 are more fully described in responses to items 2(c), 2(d) and 2(f) below.

Table 1. Description of and Implementation Schedule for Generic Letter 2004-02 Corrective Actions

Corrective Action Description	Completion Date or Expected Schedule
1. Containment walkdown, consistent with draft NEI 02-XX (Reference 1)	Completed April, 2002
2. NEI 02-01 (Reference 2) containment walkdown of containment coatings	Completed June 2, 2005
3. NEI 02-01 containment walkdown of containment dirt, dust, and lint (latent debris).	Completed April 20, 2005
4. The following corrective action activities will be completed: a. Evaluation of the downstream effects (Reference 3) b. NEI 04-07 (Reference 4) evaluation of the upstream effects c. Resolution of debris generation calculation unverified assumption of 5D zone of influence (ZOI) for qualified coatings (via coatings testing)	May 1, 2006
5. An update of the information contained in Generic Letter 2004-02 Requested Information Item 2	June 1, 2006
6. The following evaluations and testing will be completed: a. Industry chemical effects testing b. NEI 04-07 debris generation calculation c. NEI 04-07 debris transport calculation d. Evaluation of the chemical effects impact on sump-strainer head loss e. Replacement sump strainer head loss testing f. Confirmation that the replacement sump strainer design provides for available NPSH to be in excess of required NPSH g. Replacement sump strainer structural analysis	September 1, 2006
7. Completion of the final site acceptance review of the Westinghouse evaluation team analysis final report	September 1, 2006
8. The following items will be completed: a. Replacement of containment recirculation sump strainers b. Installation of containment debris barriers and potential modification of debris interceptors c. Evaluation and implementation of potential modification of safety injection system to address downstream effects	Prior to restart from Fall 2006 refueling outage
9. Removal of containment spray system (CSS) pump cyclone separators, if required, based on the results of the downstream effects evaluation	December 31, 2007

Corrective Action Description	Completion Date or Expected Schedule
10. The following programs and controls will be implemented to control sources of debris. a. Programmatic controls on potential sources of debris introduced into containment b. Implementation of a containment coatings assessment program c. Implementation of a containment latent debris assessment program	December 31, 2007
11. Implementation of changes to the inspection processes for the installed sump strainers	December 31, 2007
12. Full implementation of all plant modifications and related administrative controls that support the NEI 04-07 analysis package	December 31, 2007

NRC Requested Information 2(c):

> **[Provide] A description of methodology that was used to perform the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The submittal may reference a guidance document (e.g., Regulatory Guide 1.82, Rev. 3, industry guidance) or other methodology previously submitted to the NRC. (The submittal may also reference the response to Item 1 of the Requested Information described above. The documents to be submitted or referenced should include the results of any supporting containment walkdown surveillance performed to identify potential debris sources and other pertinent containment characteristics.)**

WCNOC Response 2(c):

Analysis is currently being performed to determine the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. These analyses conform to NEI 04-07 (reference 4) except for the refinements and exceptions noted in the paragraphs below. As indicated above, some portions of the analyses, including vendor specific testing of the sump strainer utilizing a bounding WCGS specific debris mix, as well as the chemical effects evaluation utilizing WCGS representative materials are not complete.

For many of the areas requiring analysis and/or evaluation, these analyses and evaluations were performed by or are being performed by an analysis team under contract with WCNOC. The Utilities Service Alliance selected Westinghouse Electric Company as the team lead to supply analysis services for participating utilities to support the Generic Letter 2004-02 requested evaluations. The analysis team is comprised of Westinghouse Electric Company (Westinghouse), Alion Science and Technology (Alion), Enercon Services (Enercon), and Transco Products (Transco). This effort is being performed under Westinghouse's 10CFR50

Appendix B quality assurance program. Upon completion of the individual reports and evaluations, Westinghouse will provide a final report to WCNOC, which will contain all evaluations and analyses that were performed. WCNOC will then perform a site acceptance review of the final report and, upon approval, will retain it as a quality assurance record. WCNOC expects this to be complete by September 1, 2006.

Westinghouse is responsible for performing the debris ingestion evaluation, downstream effects component wear evaluation, reactor vessel blockage, and reactor fuel blockage evaluations. Alion is responsible for performing the debris generation and debris transport evaluations and analyses. Enercon is responsible for performing the upstream and the downstream effects ECCS and CSS components blockage evaluation. As of this date, Transco has not performed any analysis or evaluation for WCNOC in support of Generic Letter 2004-02 issues.

As described above, the general methodology used for analysis of Generic Letter 2004-02 issues is that contained within NEI 04-07 except for the refinements and exceptions noted in the paragraphs below. Specific references to NEI 04-07 in the following paragraphs may refer to either of the two volumes that comprise NEI 04-07. NEI 04-07, Volume 1 is the PWR sump performance evaluation methodology, and NEI 04-07, Volume 2 is the associated NRC safety evaluation.

The following areas are included in the analyses to determine the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of debris generation:

1. Break Selection
2. Debris Generation/ Zone of Influence (Excluding Coatings)
3. Debris Characteristics (Excluding Coatings)
4. Latent Debris
5. Debris Transport
6. Coatings Evaluation
7. Head Loss
8. Chemical Effects
9. Upstream Effects
10. Downstream Effects

The specific approaches used for each of these areas are described below.

1. <u>Break Selection</u>

Break selection consisted of determining the size and location of the high energy line breaks (HELBs) that will produce debris and potentially challenge the performance of the containment emergency sump strainer. Since this break location is not known prior to the evaluation, the break selection process required evaluating a number of break locations in order to identify the location that is likely to present the greatest challenge to post-accident sump performance. The debris inventory and the transport path were both considered when making this determination.

Sections 3.3.4 and 4.2.1 in NEI 04-07, Vol. 1 recommend that a sufficient number of breaks in each high-pressure system that rely on recirculation be considered to ensure that the breaks that bound variations in debris generation by the size, quantity, and type of debris are identified. At a minimum, the following break locations were considered:

- Breaks with the largest potential for debris
- Large breaks with two or more different types of debris
- Breaks in the most direct path to the sump
- Large breaks with the largest potential particulate debris to insulation ratio by weight
- Breaks that generate a "thin bed" – high particulate with 1/8 inch fiber bed

A review of the accident analysis and operational procedures was performed to determine the scenarios that require the ECCS and CSS to take suction from the containment emergency recirculation sump. This review identified the high energy piping systems that were evaluated for a postulated HELB and associated debris generation.

Break location selection identified the breaks that produce the maximum amount of debris and also the worst combination of debris with the possibility of being transported to the recirculation sump strainer. From Section 3.3.4.1, Item 7, of NEI 04-07, Vol. 2, piping under 2 inches in diameter was excluded when determining the limiting break conditions.

Large Break Loss of Coolant Accidents (LBLOCAs)

The WCGS updated safety analysis report (USAR) Section 15.6.5 classifies LBLOCAs as equal to or greater than one square foot cross sectional break area. These events will result in full engineered safety features initiation, which initiates two centrifugal charging pumps (CCPs), two safety injection (SI) pumps, two residual heat removal (RHR) pumps, and two CSS pumps (refer to USAR Sections 6.2.2 and 6.3.2).

A review of the piping drawings associated with the reactor coolant system (RCS) was performed to identify those lines directly attached to the RCS. Loss of reactor coolant boundary limits (isolation points) assumed in the WCNOC licensing bases are defined in USAR Figure 3.6-2. Four cases are characterized for RCS-attached piping based upon flow and valve position. High energy break locations and break types are shown in USAR Figure 3.6-1. In each of the piping configurations depicted in Figure 3.6-1, the applicable LOCA boundary (isolation point) is located within the secondary shield wall. It is concluded, therefore, that LOCAs outside the secondary shield wall are not included within the current licensing bases, are not evaluated for debris generation, and will not lead to emergency containment sump recirculation.

The design basis LOCA is based upon a postulated double-ended cold leg guillotine break on the reactor coolant pump (RCP) discharge line. From a debris generation perspective, however, the hot leg and crossover legs are larger in diameter, which increases the zone of influence. The lack of compartmentalization also increases the potential for debris generated since break zones of influence (ZOIs) may extend to adjacent loops.

Three separate LBLOCAs are assessed to identify the break with the potential to generate the largest quantity of debris. Additionally, all of the breaks noted below generate two or more types of debris. These break locations are:

1. 31 inch RCS crossover line in loop A
2. 31 inch RCS crossover line in loop D
3. 29 inch RCS hot leg steam generator nozzle in loop D

In addition, LBLOCA locations were assessed to identify the break with the potential to generate the largest particulate debris to fibrous insulation ratio. The LBLOCA location that was chosen to have the largest potential particulate debris to fibrous insulation ratio by weight was a break in a reactor vessel nozzle. This break was chosen since there is Min-K microporous insulation installed in the reactor cavity with limited amounts of fibrous insulation.

Small Break Loss of Coolant Accidents (SBLOCAs)

The WCGS USAR classifies SBLOCAs as a rupture of the reactor coolant pressure boundary with a total cross-sectional area less than 1 square foot in which the normally operating charging system flow is not sufficient to sustain pressurizer level and pressure. Since SBLOCAs may not be able to be isolated, they must still be considered for debris generation, as many could eventually lead to emergency sump recirculation. According to NEI 04-07, Vol. 2, only SBLOCA lines 2 inches and larger are included in this evaluation up to the first isolation point.

As discussed in the LBLOCA section above, loss of reactor coolant boundary limits (isolation points) assumed in the WCNOC licensing bases are defined in USAR Figure 3.6-2. Four cases are characterized for RCS-attached piping based upon flow and valve position. High energy break locations and break types are shown in USAR Figure 3.6-1. In each of the piping configurations depicted in Figure 3.6-1, the applicable LOCA boundary (isolation point) is located within the secondary shield wall. It is concluded, therefore, that LOCAs outside the secondary shield wall are not included within the current licensing bases, are not evaluated for debris generation, and will not lead to emergency containment sump recirculation.

Although a LBLOCA scenario presented above may have resulted in the largest amount of debris generated, the WCGS minimum water level following a SBLOCA may not be sufficient to completely submerge the replacement containment sump strainers. Specifically, a 3 inch pipe break or smaller may result in RCS pressure that would not be low enough to discharge the safety injection accumulators or containment pressure high enough to actuate containment spray. Therefore, a 3 inch or smaller, pipe break would result in a containment water inventory that may not be sufficient to submerge the replacement containment sump strainers. A break in the 3 inch alternate charging line was assessed to provide a debris value associated with the resultant lower water level and partially submerged replacement sump strainers.

Other HELB Scenarios

While LOCAs are considered the most likely type of debris generating HELBs that could lead to containment emergency sump recirculation, other scenarios were evaluated to determine whether or not these breaks result in debris generation followed by the need for ECCS recirculation as a means of long term core cooling. A secondary side line (main steam or main feedwater) will not cause WCGS to go to ECCS recirculation from the containment sump because of the safety-related containment coolers' capability to control containment pressure. Therefore, breaks on the secondary side are not considered in the GSI-191 evaluation.

Exception(s) to NEI 04-07 Taken to Date for Break Selection

At this time, the only identified exception taken to NEI 04-07 for break selection is the use of the "every five feet" criteria described in Section 3.3.5.2 of NEI 04-07, Vol. 2.

NEI 04-07 Vol. 2, Section 3.3.5.2 advocates break selection at 5-foot intervals along a pipe in question but clarifies that "the concept of equal increments is only a reminder to be systematic and thorough." It further qualifies that recommendation by noting that a more discrete approach driven by the comparison of debris source term and transport potential can be effective at placing postulated breaks. The key difference between many breaks (especially large breaks) will not be the exact location along the pipe, but rather the envelope of containment material targets that is affected. A more comprehensive approach was taken for break selection, which accounts for the consistent use of Nukon insulation throughout the reactor building and the extensive zone of influence associated with that material. The ZOI equivalent to 17 pipe diameters (17D ZOI) for the Nukon insulation used on RCS piping at WCGS is equivalent to a sphere with an approximate 40 ft radius, dependant upon the size of the particular pipe break. A spherical ZOI of that size is bounded by structural barriers surrounding the RCS, i.e., the reactor cavity and secondary shield wall, the floor and operating floor slabs, etc. The specific location along a particular pipe has little if any impact on debris generated. Specific break locations were selected by plotting the ZOI along the RCS piping to maximize major targets that fall within the perimeter of the ZOI sphere.

2. Debris Generation/Zone of Influence (Excluding Coatings)

The debris generation evaluation consisted of two primary steps:

- Determine the Zone of Influence (ZOI) in which debris is generated.
- Identify the characteristics (size distribution) of the destroyed debris.

The ZOI is defined as the volume about a given HELB in which the fluid escaping from the break has sufficient energy to generate debris from insulation, coatings, and other materials within the zone. NEI 04-07 defines the ZOI as spherical and centered at the break site or location. The radius of the sphere is determined by the pipe diameter and the destruction pressures of the potential target insulation or debris material. All significant debris sources (insulation, fixed debris, etc.) within the ZOI are evaluated.

Section 4 of NEI 04-07, Vol. 1 allowed for the development of target-based ZOIs, taking advantage of materials with greater destruction pressures. The WCNOC evaluation uses multiple ZOIs at the specific break location dependent upon the target debris. The destruction pressures and associated ZOI radii for common PWR materials are taken from Table 3-2 of NEI 04-07, Vol. 2.

Materials that were absent applicable experimental data or documentation are conservatively assumed to have the lowest destruction pressure adopted. That destruction pressure is equivalent to a ZOI equal to 28.6 pipe diameters (28.6D ZOI).

Robust barriers consisting of structures and equipment that are impervious to jet impingement are utilized in the evaluation. Some of these barriers include the primary shield wall, the refueling cavity walls, and the steam generators. Per the guidance given in Section 3.4.2.3 of NEI 04-07, Vol. 2, when a spherical ZOI extended beyond a robust barrier, the barriers may prevent further expansion of the break jet but they can also cause deflection and reflection. Section 3.4.2.3 NEI 04-07, Vol. 2 states that when a spherical ZOI extends beyond robust barriers such as walls or encompasses large components such as tanks and steam generators, the extended volume may be conservatively truncated. NEI 04-07, Vol. 2 also stipulates that "shadowed" surfaces of components should be included in the analysis. These approaches are utilized within the WCNOC debris generation evaluation.

The general methodology that is used in the debris generation calculation consists of identifying a HELB, establishing the corresponding ZOI, mapping the ZOI volume over the spatial layout of insulated piping, and calculating the volume of insulation within that ZOI.

As discussed in NEI 04-07 Vol. 1, a sufficient number of breaks in each high-pressure system that rely on containment emergency recirculation should be evaluated to ensure the most limiting quantity of debris is generated and transported to the sump.

The following break locations are considered for the debris generation calculation:

Break No. 1: Break at the loop A crossover leg
Break No. 2: Break at the loop D crossover leg
Break No. 3: Break at loop D steam generator hot leg nozzle
Break No. 4: Reactor vessel Cold Leg Nozzle Break
Break No. 5: Alternate charging line at D loop cold leg (for small break LOCA)

<u>Basis for selecting Break Nos. 1 through 3</u>

As discussed in 2(c) Item 1 above for LBLOCAs, breaks on the hot leg and crossover legs are chosen based on their larger diameter, which increases the zone of influence. The debris generation calculation determines that there is approximately 15 percent difference between the largest and smallest debris values among the four loops, but breaks in loops A and D generate more debris than a break in either loop B or C. A break in loop A has potential to impact loop B, due to the compartment wall configuration, as well as adjacent loop D. A break in loop D has the potential to impact pressurizer piping in addition to adjacent loop A. Break locations in loop A and loop D are evaluated to ensure the RCS break with the largest potential for debris is identified consistent with the guidance of NEI 04-07 Vol. 2, Sections 3.3.4.1 and 4.2.1.

Breaks in loop D impact the pressurizer compartment and generate more debris than breaks in loop A. Evaluation of the loop D hot leg and loop D crossover leg breaks indicates that there is little difference (approximately 5 percent) between the fibrous debris generated for these two locations. However, the spool piece in the middle of the crossover leg is approximately 10 feet below the steam generator nozzles and other RCS piping. The closer proximity to the concrete floor results in significantly more coatings debris from a break in this location. The results of the analysis reveal that an RCS break at the loop D crossover leg is most limiting for debris generation based on the combined quantities of fibrous and particulate (coating) debris.

Basis for selecting Break No. 4

Among the break locations recommended in NEI 04-07 Vol. 2, Sections 3.3.4 and 4.2.1 is a break with the largest potential particulate debris to fibrous insulation ratio by weight. WCGS has Min-K microporous insulation installed in the reactor cavity with limited fibrous insulation. A break in the reactor cavity is assessed, therefore, consistent with this criterion. The loop A cold leg is selected since the insulation volume is the largest among the hot/cold legs in the four loops.

Basis for selecting Break No. 5

The limiting case for a "thin bed" effect was determined to be a small break LOCA. A break in the 3 inch alternate charging line at the loop D cold leg (Break 5) was determined to produce a significant amount of coating particulate with minimal fibrous debris as well as representing the lowest water level. Loop D was selected since it generates more coatings debris than the other RCS-attached lines 3 inches and smaller.

Exception(s) to NEI 04-07 Taken to Date for Debris Generation/Zone of Influence

At this time, WCNOC has not identified any exceptions to NEI 04-07 for evaluating debris generation/zone of influence except as described in the response to the Break Selection section above.

3. Debris Characteristics (Excluding Coatings)

The debris generation evaluation determined the debris source term by review of existing applicable specifications and drawings.

The results of the reviews were compiled in the debris generation evaluation. The following insulation types are considered in the evaluation:

- Nukon
- Transco Thermal Wrap
- Diamond Power Mirror reflective metal insulation (RMI)
- Min-K
- AlphaMat D
- Cerablanket
- Foamglas

Additionally, fire barrier materials Thermo-Lag 330-1 Subliming Coating Envelope System and Darmatt KM1 are present in the reactor building.

Although a two-size debris size distribution for insulation materials is adequate for a baseline analysis, it allows for only limited benefit when computational fluid dynamics (CFD) analyses are used to refine the recirculation pool debris transport fractions. The NRC recognized this limitation in NEI 04-07, Vol. 2, Section 4.2.4 which recommends a four category size distribution including: (1) fines that remain suspended, (2) small piece debris that is transported along the pool floor, (3) large piece debris with the insulation exposed to potential erosion, and (4) large debris with the insulation still protected by a covering, thereby preventing further erosion. The methodology that can be used to determine the fraction of debris falling within each of the four size categories is explained in Appendices II and VI of NEI 04-07, Vol. 2, but the percentages to allot for each debris type was not specified. The vendor performing the debris generation evaluation utilized proprietary analysis to develop a four size category debris distribution for Nukon and Thermal Wrap insulation materials.

The debris size distribution for RMI is based on the size distribution presented in NUREG/CR-6808 (Reference 6).

An assumed maximum destruction, 100 percent fines, is used for materials for which insufficient debris generation data is not readily available to conservatively estimate debris size.

Exception(s) to NEI 04-07 Taken to Date for Debris Characteristics

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with debris characteristics.

4. Latent Debris

WCNOC has elected to use a bounding value of 200 lbm for the latent debris source term evaluated in containment. To justify the acceptability of that value, a containment walkdown surveillance was conducted during the Spring 2005 refueling outage to collect and quantify the latent debris that exists. The determination of latent debris quantity was performed in a manner consistent with NEI 04-07, Vol. 2 section 3.5.2.2, option 2. Subsequent to those walkdowns, an assessment was performed to conservatively quantify the latent debris that could exist in the WCGS containment. This assessment conservatively determined the debris loading to be less than 65 lbm. Therefore, using a bounding value of 200 lbm for the latent debris source term is conservative.

Tags, tape, and other miscellaneous latent debris are also included in the NEI 04-07 debris generation calculation.

Exception(s) to NEI 04-07 Taken to Date for Latent Debris

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with latent debris.

5. Debris Transport

The methodology used in the WCNOC analysis for debris transport is based on NEI 04-07, Vol. 1 for refined analyses as modified by NEI 04-07, Vol. 2, as well as the refined methodologies suggested by NEI 04-07, Vol. 2 in Appendices III, IV, and VI. The specific effect of each mode of transport was analyzed for each type of debris generated, and a logic tree was developed to determine the total transport to the sump strainers for each type of debris. The size distribution and characterization for the specific debris types comes from the debris generation calculation.

The basic methodology being used for transport analysis is summarized as follows:

- Based on relevant containment building drawings, a three-dimensional model is built using computer aided drafting (CAD) software.
- A review is made of the drawings and CAD model to determine transport flow paths. Potential upstream blockage points are taken into consideration.
- Debris types and size distributions are gathered from the debris generation calculation for each postulated break location.
- The fraction of debris blown into upper containment is determined based on the volumes of upper and lower containment.
- The quantity of debris washed down by spray flow is determined.
- The quantity of debris transported to inactive areas or directly to the sump strainers is calculated based on the volume of the inactive and sump cavities proportional to the water volume at the time these cavities would be filled.
- The location of each type/size of debris at the beginning of recirculation is determined.
- A CFD model is developed to simulate the flow patterns that would occur during recirculation.
- The recirculation transport fractions from the CFD analysis is gathered to input into the logic trees.
- The quantity of debris that could experience erosion due to the break flow or spray flow is determined.
- The overall transport fraction for each type of debris is determined by combining each of the previous steps in logic trees.

The CFD calculation for WCNOC utilized a minimum containment flood level of 1 foot-11 inches above the annulus floor for the LBLOCA scenario and a minimum containment flood level of 8 inches above the annulus floor for the SBLOCA scenario. This pool depth occurs following the switchover to recirculation. These minimum flood levels are based on vendor calculations in support of the Generic Letter 2004-02 analysis.

The debris generated at the limiting LBLOCA break location at loop D crossover leg was selected for the debris transport. As stated above, a LBLOCA on loop D crossover leg yields the highest quantity of fiber and coating debris. This event also generates micro-porous particulate and RMI debris.

The CFD model includes proposed debris barriers at the secondary shield wall entrances to loops A and D. Since the flow transport path from loops A and D secondary shield wall entrances would be the shortest to the containment sumps, the addition of the debris barriers at loops A and D was selected to increase the distance from the break to the containment sumps. Flow from the break would need to travel from the B and C loop secondary shield wall entrances to reach the containment sumps. It is anticipated that this increased flow path from the loops B and C secondary shield wall entrance doors will reduce the amount of transportable debris at the containment sumps by taking advantage of low velocity areas of the pool.

For conservatism, the debris generated from the loop D break was assumed at loop C. Loop C was selected for the most direct path to the sump since debris barriers will be placed at the loop A and D secondary shield wall entrance doors (i.e., the limiting flow path will be combined with the limiting debris value).

A modification may be used to reduce the amount of debris that reaches the containment sump by installing debris interceptors at locations determined to be beneficial and appropriate by the CFD analysis.

Exception(s) to NEI 04-07 Taken to Date for Debris Transport

At this time, the only identified exception taken to NEI 04-07 for debris transport is the assumption of uniform debris distribution.

The debris transport analysis does not broadly assume a uniform distribution of debris in the containment pool, but considers a distribution of debris based on the following:

- Since the various types and sizes of debris transport differently during the blowdown, washdown, and pool fill-up phases, the initial distribution of this debris at the start of recirculation could vary considerably. Insulation debris on the pool floor would be scattered around by the break flow, as the pool fills, and debris in upper containment would be washed down at various locations by the spray flow. Due to the fact that the containment pool does not flow preferentially in any given direction after the inactive and sump cavities have been filled and before recirculation begins, it is assumed that the debris washed down by containment sprays would remain in the general vicinity of the washdown locations until recirculation starts.

- Latent Debris - With the exception of latent debris washed to the sump strainer or to inactive cavities during pool fill-up, it is assumed that all of the latent debris in containment (particulate matter and fibers) would be uniformly distributed on the containment floor at the beginning of recirculation.

- Fine Debris - With the exception of debris washed directly to the sump strainer or to inactive areas, it is assumed that the fine debris in lower containment at the end of the blowdown would be uniformly distributed in the pool at the beginning of recirculation. The fine debris washed down from upper containment is assumed to be in the vicinity of the locations where spray water reaches the pool.

- Small and large pieces of insulation debris (RMI and Nukon) not blown to upper containment are assumed to be uniformly distributed throughout the containment area carried by flows through the pool. The small piece debris blown to upper containment is assumed to wash down in the same locations as the fine debris.

6. Coatings Evaluation

As described in Sections 3.4.3.3.3 and 3.4.3.3.4 of NEI 04-07, Vol. 1, qualified and unqualified coatings within the coating ZOI are assumed to fail and all unqualified coatings outside the coating ZOI are assumed to fail. Based on recommendations in NEI 04-07, Vol. 2, all coatings inside and outside the ZOI are assumed to fail as 10-micron spherical particles for head loss considerations.

In accordance with NEI 04-07, Vol. 1, unqualified coatings that are under intact insulation were not considered to fail.

The ZOI for qualified coatings that is used for WCNOC is 5D based on testing that is presently underway. The Utilities Service Alliance, of which WCNOC is a participating utility, has contracted with Westinghouse Electric Company to have qualified coatings tested under two phase flow conditions to determine appropriate ZOI for assuming that 100 percent of the coatings will fail. It is expected that the results of this testing will support the 5D ZOI utilized for the generation of qualified coatings debris.

Exception(s) to NEI 04-07 Taken to Date for Coatings

An exception to NEI 04-07, Vol. 2 Section 3.4.2.1 regarding the qualified coatings ZOI of 10D is being taken based on the expected results of testing that will be performed. This effort is described in more detail earlier in this section.

7. Head Loss

As stated above, WCNOC's existing recirculation sump strainers will be replaced. WCNOC has selected the strainer supplier who can provide the largest strainer surface area available for the existing plant configuration and LOCA water level. The supporting analysis and design details of the replacement sump strainers are not final but are expected to be final by May 1, 2006. The sump strainer supplier will also perform head loss testing on the replacement strainer utilizing the results of the site-specific debris generation and debris transportation evaluations. Head loss testing is currently planned for both the large break and small break containment water levels and the associated debris loadings. The testing and fabrication activities are expected to be complete by September 1, 2006. The replacement recirculation sump strainer will be of a modular design utilizing perforated plate. The replacement sump strainer was selected with the smallest hole size reasonably available, no larger than a nominal 1/16-inch diameter hole in the perforated plate of the strainer.

Exception(s) to NEI 04-07 Taken to Date for Head Loss

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with the head loss evaluation.

8. Chemical Effects

WCNOC has reviewed the results from the integrated chemical effects tests (ICET) and has determined that Test 1 (NaOH buffer with fiberglass insulation) is similar to the conditions at WCGS. WCNOC is continuing to evaluate the results of ICET Test 1 to determine plant applicability to the test parameters and to finalize implications of the test results to WCGS.

WCNOC does not expect a significant impact to sump strainer head loss due to selection of largest available sump strainer size that could fit within the current containment sump pit. It is anticipated that this sump strainer size will exceed the maximum required sump strainer surface area deemed necessary by the debris generation and transport evaluations; thereby providing margin. WCNOC intends to utilize a portion of the tested head loss (i.e. "bump up" factor) to account for the impact of chemical effects on overall sump strainer head loss.

Additional margins for chemical effects include:

- Following a HELB, the flow required to maintain the necessary core cooling decreases significantly after about the first 24 hours of the event. This allows for a significant reduction from the flow that is assumed to be creating the head loss across the strainer. As the flow decreases, the head loss also decreases, thus minimizing the impact of the debris-laden strainer.

- It is anticipated that additional margin will exist in the difference between the assumed latent debris loading in containment and the conservatively calculated latent debris loading. This approximately 135 lbm, even though not a significant difference, does result in additional available margin.

- Margin is incorporated into the debris generation calculation for tags, tape, and miscellaneous latent debris.

If chemical effects resulting from the present use of sodium hydroxide (NaOH) at WCGS do become a significant contribution to unacceptably high head loss, WCNOC will consider changing to trisodium phosphate (TSP) in the Containment Spray System.

Exception(s) to NEI 04-07 Taken to Date for Chemical Effects

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with chemical effects.

9. Upstream Effects

The vendor supplied upstream effects evaluation for WCNOC determines flowpaths, holdup volumes, and restricted flow areas upstream of the containment sump strainers. The evaluation results in changes to the minimum water level calculation to account for additional water inventory hold up points not previously considered.

Even though these evaluations have not been fully approved and accepted by WCNOC, WCNOC does not expect the results to significantly change.

Exception(s) to NEI 04-07 Taken to Date for Upstream Effects

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with upstream effects.

10. Downstream Effects

A downstream effects evaluation is being performed for WCGS by the vendor. The basic methodology used for performing these evaluations are consistent with the methods and approaches provided in NEI 04-07 and WCAP-16406-P (Reference 3). Even though these evaluations have not been fully approved and accepted by WCNOC, WCNOC does not expect the results to significantly change.

Testing is currently being developed to determine the potential impact of chemical effects for the downstream effects evaluation. Any impact on the downstream effects evaluation from chemical effects will be addressed as necessary.

The approach to these evaluations is to:

- Determine the flow paths, including all intervening components that are required to function following a LOCA and subsequent transfer to containment emergency recirculation.
- Utilizing the designed sump strainer opening of not larger than a nominal 1/16-inch, calculate the quantity of debris that would be expected to pass through the strainer.
- Determine the characteristics of the debris that is calculated to pass through the strainer.
- Evaluate the components previously identified to determine if any of the components could potentially become blocked as a result of the debris laden ECCS or CSS fluid.
- Evaluate the potential wear of critical components to determine if their design basis functions could be maintained for the required mission time.

As previously stated in the response to Item 2(a), these evaluations have not been fully approved and accepted by WCNOC. The preliminary results identified that there are several required components or flow paths that are susceptible to blockage by debris or susceptible to abrasive wear downstream of the sump strainer. These components are:

- The safety injection system throttle valves
- The containment spray pump cyclone separators

If the final results of these evaluations determine that the blockage or wear of these components would result in unacceptable ECCS performance during postulated design basis accidents, the necessary modifications or enhanced evaluations will be performed to ensure the established functions and mission time for the ECCS and CSS will be maintained throughout the course of the accident. The use of NEI 04-07 Chapter 6 Alternate Evaluation methodology and the potential incorporation of debris interceptors may be used to reduce debris quantity.

<u>Exception(s) to NEI 04-07 Taken to Date for Downstream Effects</u>

At this time, WCNOC has not identified any exceptions to NEI 04-07 associated with downstream effects.

NRC Requested Information 2(d): The submittal should include, at a minimum, the following information:

NRC Requested Information 2(d)(i):

> **[Provide] The minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen.**

WCNOC Response 2(d)(i):

The minimum available NPSH with an unblocked sump strainer has not been determined at this time since the head loss across the replacement sump strainers will be determined as part of the head loss testing in conjunction with the sump strainer procurement process.

NRC Requested Information 2(d)(ii):

> **[Provide] The submerged area of the sump screen at this time and the percent of submergence of the sump screen (i.e. partial or full) at the time of the switchover to sump recirculation.**

WCNOC Response 2(d)(ii):

The replacement sump strainer will be completely submerged at the time of ECCS switchover to recirculation for LBLOCA water level conditions. The replacement sump strainer is anticipated to be approximately 85 percent submerged, at the time of ECCS switchover to recirculation for SBLOCA water level conditions. A section of the minimum containment water level calculation specifically addresses a SBLOCA condition when the safety injection accumulators do not discharge and the containment spray system does not activate.

NRC Requested Information 2(d)(iii):

> **[Provide] The maximum head loss postulated from debris accumulation on the submerged sump screen, and a description of the primary constituents of the debris bed that result in this head loss. In addition to debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment (thermal and chemical) and CSS washdown should be considered in the analyses. Examples of this type of debris are disbonded coatings in the form of chips and particulates and chemical precipitants by chemical reactions in the pool.**

WCNOC Response 2(d)(iii):

As previously provided in response to 2(c), item 7, the maximum predicted head loss will be determined through replacement strainer head loss testing. The primary constituents of the debris bed that result in this head loss include fiberglass fibers, coatings particulate, latent debris particles, and latent debris fibers.

WCNOC intends to utilize a portion of the tested head loss (i.e. "bump up" factor) to account for the impact of chemical effects. Refer to the response provided for 2(c) item 8 for discussion of the areas of margin that will ensure adequate margin will exist in the design and function of the replacement strainer to ensure sufficient NPSH is available for the ECCS and CSS pumps.

NRC Requested Information 2(d)(iv):

> **[Provide] The basis for concluding that the water inventory required to ensure adequate ECCS or CSS recirculation would not be held up or diverted by debris blockage at choke-points in containment recirculation sump return flow paths.**

WCNOC Response 2(d)(iv):

An Upstream Effects evaluation has been completed by the vendor that confirms that potential water inventory, diversions, flow paths, choke points etc. have been adequately included in the containment LOCA water level calculations. The results indicate that all water holdup areas have been appropriately included in the containment minimum water level calculation. WCNOC will confirm the accuracy of these results during site acceptance of the vendor analysis package.

NRC Requested Information 2(d)(v):

> **[Provide] The basis for concluding that inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flowpaths downstream of the sump screen, (e.g., a HPSI throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles). The discussion should consider the adequacy of the sump screen's mesh spacing and state the basis for concluding that adverse gaps or breaches are not present on the screen surface.**

WCNOC Response 2(d)(v):

As previously described in response to 2(c) Item 10 above, a downstream effects evaluation is being performed for WCNOC consistent with the methods and approaches provided in WCAP-16406-P (Reference 3). Even though these evaluations have not been approved and accepted by WCNOC, the results are not expected to change.

The downstream effects evaluation describes required corrective actions that once implemented, will ensure that inadequate core and containment cooling will not result due to debris blockage at flow restrictions in the ECCS and CSS flow paths downstream of the sump strainers. As discussed in 2(c) item 10, above, several corrective actions may be necessary. For example, based on the preliminary results of the downstream effects equipment blockage evaluation, a modification to the safety injection system throttle valves may be necessary to correct the potential blockage concerns identified in the downstream effects analysis. Additionally, based on the results of the downstream effects equipment blockage evaluation, the containment spray pump cyclone separators may need to be removed.

These evaluations are based on a maximum sump strainer opening of no larger than a nominal 1/16-inch diameter. The sump strainer vendor's strainer unit, by design, will ensure that there are no openings or gaps in its design or construction that would be in excess of the maximum strainer opening. WCNOC will ensure that the installation of the replacement strainers will not result in openings in excess of the maximum strainer opening. Additionally, as part of the programmatic and process changes that will be implemented, the necessary inspections will be established to ensure continuing compliance with this requirement.

NRC Requested Information 2(d)(vi):

> **[Provide] Verification that close-tolerance subcomponents in pumps, valves and other ECCS and CSS components are not susceptible to plugging or excessive wear due to extended post-accident operation with debris-laden fluids.**

WCNOC Response 2(d)(vi):

As previously described in response to 2(c) item 10, a downstream effects evaluation is being performed for WCNOC consistent with the methods and approaches provided in WCAP-16406-P (Reference 3). Even though these evaluations have not been approved and accepted by WCNOC, the results are not expected to change.

The downstream effects evaluation describes required corrective actions that, once implemented, will ensure that ECCS and CCS components are not susceptible to plugging or excessive wear during post-accident operation. As discussed in 2(c) items 10 and 2(d)(v) above, several corrective actions may be necessary including:

- A modification to the safety injection system throttle valves to correct potential plugging and wear erosion concerns identified in the downstream effects analysis.
- A modification to the containment spray pump cyclone separators to correct potential plugging concerns identified in the downstream effects analysis.

NRC Requested Information 2(d)(vii):

> **[Provide] Verification that the strength of the trash racks is adequate to protect the debris screens from missiles and other large debris. The submittal should also provide verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.**

WCNOC Response 2(d)(vii):

The location of the Wolf Creek recirculation sump strainers, outside the secondary shield walls, eliminates the requirements for missile barrier resistance since the LOCA break locations that could lead to ECCS recirculation are located inside the secondary shield walls. The structural evaluation of the replacement sump strainer will be completed as part of the replacement containment sump strainer procurement process. The replacement strainers will be designed to be sufficiently robust so that the strainer can also function as a trash rack simultaneously.

NRC Requested Information 2(d)(viii):

> **If an active approach (e.g., backflushing, powered screens) is selected in lieu of or in addition to a passive approach to mitigate the effects of the debris blockage, describe the approach and associated analyses.**

WCNOC Response 2(d)(viii):

The WCGS replacement sump strainer will be a passive strainer. WCNOC is not pursuing any form of active strainer design; therefore this item is not applicable.

NRC Requested Information 2(e):

> **[Provide] A general description of and planned schedule for any changes to the plant licensing bases resulting from any analyses or plant modifications made to ensure compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. Any licensing actions or exemption requests needed to support changes to the plant licensing basis should be included.**

WCNOC Response 2(e):

At the present time, WCNOC has not identified the need for any regulatory relief requests, or required changes to the operating license or Technical Specifications.

Two possible license amendments are being considered:

1. A potential change from NaOH to Trisodium phosphate (TSP) in the Containment Spray System. This determination will be made upon completion of the replacement strainer head loss testing including the contribution of chemical effects.

2. Use of the NEI 04-07 Chapter 6 Alternate Evaluation. The use of the Chapter 6 methodology would be considered if additional margin is necessary after the completion of the downstream effects analysis.

If relief requests or license amendments are identified, the NRC will be promptly notified.

The portions of the WCNOC licensing basis impacted by ongoing analyses or planned plant modifications to ensure compliance with the regulatory requirements described in this Generic Letter will be changed upon implementation of the associated analysis or plant modification. If the analysis or modification is implemented prior to the final implementation of the NEI 04-07 analysis, then the basis for acceptability of the analysis or plant modification will be WCNOC's licensing basis prior to the implementation of the NEI 04-07 analysis. If the analysis or modification is implemented in conjunction with the final implementation of the NEI 04-07 analysis, then the basis for acceptability of the analysis or plant modification will be the licensing basis after the implementation of the NEI 04-07 analysis. WCNOC licensing basis documents will be updated in accordance with the requirements of 10 CFR 50.71.

NRC Requested Information 2(f):

> **[Provide] A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment (e.g. insulations, signs, coatings, and foreign materials) will be assessed for potential adverse effects on the ECCS and CSS recirculation functions. Addressees may reference their responses to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating deficiencies and Foreign Material in Containment," to the extent that their responses address these specific foreign material control issues.**

WCNOC Response 2(f):

Programmatic controls that were implemented as interim compensatory measures are described in WCNOC's response to NRC Bulletin 2003-01 (References 7 and 8). The programmatic, process, and procedural changes currently proposed to be reviewed and revised in support of Generic Letter 2004-02 analyses and evaluations are listed below.

1. WCNOC will implement changes to administrative process controls necessary to ensure consideration of potential impacts on Generic Letter 2004-02 analyses and evaluations. The impacted process controls changes identified to date include:

    a. Changes to design change process procedures to ensure that necessary engineering evaluations will be performed when preparing a change to the plant design that either directly or indirectly affects containment, ECCS, or CSS.

    b. Changes to the containment entry and material control procedure to enhance requirements during plant modes 1 through 4 for control of materials during work activities conducted in the containment and for control of radiological postings.

    c. Changes to the clearance orders procedure to ensure that Generic Letter 2004-02 analyses and evaluations are considered prior to making future changes to existing requirements that clearance order tags are not installed on components inside the containment being removed from service (tagged out) during plant modes 1 through 4.

    d. Changes to the work request procedure to ensure that Generic Letter 2004-02 analyses and evaluations are considered prior to making future changes to existing requirements that work request tags are not installed on components inside the containment.

    e. Changes to the scaffold construction and use procedure to enhance requirements for control of scaffold tags and materials used during work activities conducted in the containment during plant modes 1 through 4.

2. WCNOC will implement a containment inspection program that includes the attributes necessary to support the continued validity of the inputs and assumptions associated with the Generic Letter 2004-02 analyses and associate plant design features. This includes containment coatings condition assessment program in accordance with EPRI 1003102, Rev. 1 (Reference 5) and a containment latent debris assessment program in accordance with the guidance of NEI 04-07, Vol. 2.

3. WCNOC will implement changes to inspection procedures to ensure that the installed replacement strainers will not have openings in excess of the maximum designed strainer opening.

The programmatic, process, and procedural changes described above will be implemented in stages as previously described in response to item 2(b).

References:

1. NEI 02-XX [Draft 0], Condition Assessment Guidelines: Debris Sources Inside PWR Containments, Nuclear Energy Institute, 1776 I Street N. W., Suite 400, Washington D.C., December 2001

2. NEI 02-01, Revision 1, Condition Assessment Guidelines: Debris Sources Inside PWR Containments, Nuclear Energy Institute, 1776 I Street N. W., Suite 400, Washington D.C., September 2002

3. WCAP-16406-P, Evaluation of Downstream Sump Debris Effects in Support of GSI-191, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, PA 15230-0355, June 2005

4. NEI 04-07, Pressurized Water Reactor Sump Performance Evaluation Methodology, Revision 0, Nuclear Energy Institute, 1776 I Street N. W., Suite 400, Washington D.C., December 2004

5. EPRI 1003102, Rev. 1, Guidelines on Nuclear Safety-Related Coatings, Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, CA 94304, November, 2001

6. NUREG/CR-6808, Knowledge Base for the Effect of Debris on Pressurized Water Reactor Emergency Core Cooling Sump Performance, LA-UR-03-0880, Los Alamos National Laboratory, Los Alamos, NM 87545, February 2003

7. Letter WO 03-0049, dated August 8, 2003, from Britt T. McKinney, WCNOC, to USNRC

8. Letter WM 04-0050, dated November 5, 2004, from Richard A. Muench, WCNOC to USNRC

LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation in this document. Any other statements in this letter are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Kevin Moles, Manager Regulatory Affairs at Wolf Creek Generating Station, (620) 364-4126.

Regulatory Commitment	Due Date
1. The following corrective action activities will completed: a. Using WCAP-16406-P, evaluate the effects of debris-laden fluid on systems and components downstream of the containment emergency sump strainers during the ECCS recirculation phase of design basis accidents. b. Using NEI 04-07, evaluate the effects of design basis accident conditions on the ability of structures, systems and components upstream of the containment emergency sump strainers to mitigate the consequences of the analyzed accidents. c. Using the results of containment coatings testing, resolve the unverified assumption in the NEI 04-07 debris generation calculation of a 5 pipe diameter zone of influence for qualified containment coatings.	May 1, 2006
2. Submit an update to information contained in WCNOC's response to Generic Letter 2004-02 Requested Information Item 2.	June 1, 2006
3. The following evaluations and testing will be completed: a. Perform industry chemical effects testing on the replacement containment emergency sump strainers. b. Using NEI 04-07, perform a debris generation calculation for the analyzed design basis accidents. c. Using NEI 04-07, perform a debris transport calculation for the analyzed design basis accidents. d. Evaluate the impact of chemical effects on containment emergency sump strainer head loss during design basis accident conditions. e. Complete head loss testing of the replacement containment emergency sump strainer. f. Confirm that the available NPSH of the replacement containment emergency sump strainers during design basis accident conditions is in excess of the required NPSH. g. Perform a structural analysis of the replacement containment emergency sump strainers during design basis accident conditions.	September 1, 2006

Regulatory Commitment	Due Date
4. Complete the final site acceptance review of the Westinghouse evaluation team analysis summary report.	September 1, 2006
5. The following items will be completed: a. Replace the containment emergency recirculation sump strainers. b. Install containment debris barriers and modify containment debris interceptors if required. c. Modify safety injection system components, if required, based on the results of the downstream effects evaluation.	Prior to restart from Fall 2006 refueling outage
6. Remove the containment spray system pump cyclone separators, if required, based on the results of the downstream effects evaluation.	December 31, 2007
7. The following programs and controls will be implemented to control sources of debris. a. Implement changes to programmatic controls for (1) design change process procedures, (2) containment entry and material control procedures, (3) clearance orders procedures, (4) work request procedures, And (5) scaffold construction and use procedures to control the introduction of potential sources of debris into containment. b. Implement a containment coatings assessment program. c. Implement a containment latent debris assessment program.	December 31, 2007
8. Implement changes to inspection processes for the installed sump strainers to ensure they support the associated analyses of design basis accidents.	December 31, 2007
9. Implement all plant modifications and related administrative controls that support the NEI 04-07 analysis package.	December 31, 2007